



Autonomous aerial sensors for wind power meteorology - lessons learnt

Giebel, Gregor; Schmidt Paulsen, Uwe; Reuder, Joachim ; la Cour-Harbo, Anders ; Bange, Jens ; Thomsen, Carsten ; Mølgaard, John

Published in:
Proceedings of EWEA 2012 - European Wind Energy Conference & Exhibition

Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Giebel, G., Schmidt Paulsen, U., Reuder, J., la Cour-Harbo, A., Bange, J., Thomsen, C., & Mølgaard, J. (2012). Autonomous aerial sensors for wind power meteorology - lessons learnt. In *Proceedings of EWEA 2012 - European Wind Energy Conference & Exhibition* European Wind Energy Association (EWEA).

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

ABSTRACT ID: 484

Theme: RESOURCE ASSESSMENT Topic: Advances in measuring techniques for resource assessment

AUTONOMOUS AERIAL SENSORS FOR WIND POWER METEOROLOGY - LESSONS LEARNT

Gregor Giebel(1) (F) (P) Uwe Schmidt Paulsen(1) Joachim Reuder(2) Anders la Cour-Harbo(3) Jens Bange(4) Carsten Thomsen(5) John Mølgaard(5)

(1) DTU Wind Energy, Roskilde, (2) Bergen University, Bergen, Norway(3) Aalborg University, Aalborg, Denmark(4) Tübingen University, Tübingen, Germany(5) DELTA, Hørsholm, Denmark

Introduction

This paper describes a new approach for measurements in wind power meteorology using small unmanned flying platforms. Large-scale wind farms, especially offshore, need an optimisation between installed wind power density and the losses in the wind farm due to wake effects between the turbines. Good measurements of the wake and wake structure are not easy to come by, especially offshore. Very few measurement masts exist to verify our knowledge of atmospheric physics, and most of them are situated in quite homogeneous and gentle terrain. Here, automated Unmanned Aerial Vehicles (UAVs) could be used as either an extension of current masts or to build a network of very high 'masts' in a region of complex terrain or coastal flow conditions.

Approach

In order to test the potential and limits of UAVs for wind power meteorology, this project assembles four different UAVs from four participating groups. Risø has built a lighter-than-air kite with a long tether and nano-synchronised sensors, Bergen University flies the SUMO, a pusher airplane of 580g total weight equipped with a 100Hz Pitot tube, Tübingen University in conjunction with the TU Braunschweig flies the Carolo, a 2m wide two prop model with a 5-hole pitot tube on the nose, and Aalborg University will use a helicopter with a sonic anemometer as a slung load.

Main body of abstract

Conclusion

It was planned to fly all those platforms during one week at the Danish national test station for large wind turbines at Høvsøre. One of the large lessons learnt was that permitting is a major concern - both the campaign at Høvsøre and the alternate location at Risø had to be cancelled for different reasons, both related to flying permits. There was one week of flying though at the Nøjsomheds Odde wind farm in Lolland, where we could compare the SUMO and balloon with a Lidar and data from the wind farm. The other platforms performed their tests separately. Lastly, the lessons learnt were used to do a detailed planning for a possible offshore campaign.